Center for Independent Reviews (CIE) Independent Peer Review on the Biological Opinion on the Klamath Hydroelectric Settlement Agreement and accompanying EIS

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Executive Summary

Overall the Draft Biological Opinion (Draft BO) (USFWS and NMFS 2011) is a scientifically sound document, and it presents sound science and logical reasoning to support its conclusion that the proposed action will not jeopardize SONCC coho. Put most simply, the proposal is to remove four dams that now block passage by anadromous fish. The environmental benefits of this action are likely to significantly outweigh the impacts of the removal itself and the transitory release of stored sediment, which the Draft BO does a credible job of describing. Much of the document seems unrelated to the Klamath River *per se*, but addresses the coho population and its management regionally.

Several topics are treated at multiple points in the text, with lots of repeated information each time the topic is covered, such as exposure to high suspended sediment loads and their effects on fish. This is doubtless the result of the imposed organization and the required categories, resulting in some of the information being repeated. As discussed below, the Draft BO is not clearly written in some sections, with excessive jargon.

Background

Four hydroelectric dams on the Klamath River are proposed for removal, to eliminate barriers to migration of anadromous fish. Among important issues related to this action are potential downstream effects of release of sediment stored in the reservoirs, changes in prey base resulting from altered hydrology, temperature, and nutrient dynamics, and changes resulting from eventual closure of a hatchery.

Description of Role in Review Activities

My role in this review was to conduct a desk review of the Draft BO and supporting documents that pertained to the scientific questions for which I was qualified to render an opinion. My focus was on the Draft BO, but to the extent that supporting analyses were not fully described in the Draft BO, I consulted supporting technical documents. In addition, I consulted other technical sources relevant to the issues addressed by the Draft BO and cited those references. I read the Draft BO closely and provided general and some detailed comments. For supporting documents, I did not provide detailed comments, only a general assessment on whether the sediment analyses constituted sound science on which to base decisions.

I organized my comments in response to the questions posed, as presented below.

1. Are the assumptions and the effects conclusions in the biological opinion scientifically reasonable/supportable and logical, especially pertaining to the suspended sediment analysis?

Longitudinal Changes in Suspended Sediment Load
I found the discussion of longitudinal changes in suspended sediment concentrations on pp.80-81 to be disappointing. I infer that this discussion was not written by a specialist in the field. The Draft BO implies that sand necessarily moves as bedload, when in fact much or most sand moves in suspension in a high-energy river like the Klamath. The BO could perhaps distinguish bedload from bed material load. Sediment load is typically divided by one of two ways (Hicks and Gomez 2003): 1. By transport process, into *bedload* (transported in intermittent contact with the bed, by rolling, sliding, and bouncing) and *suspended load* (maintained in suspension in the water column by turbulence). 2. As *washload* (the finer components of the suspended load, clay and silt only) vs. *bed material load*, which includes bedload and also sand transported in suspension at high flow as part of the *suspended load*.

No citation is provided for the statement, "the Sprague River has been identified as a primary source of sediment."

Without reading the source documents, such as CDFG 2011, or "Appendix C of DOI" (no year given), I was not convinced that the Draft BO was not confusing suspended sediment concentration (SSC) with turbidity (which can be caused by either suspended sediment or algal material). To obtain SSC, a sample is dried, and once-dried, algal material typically has very little weight. Thus a highly turbid sample can have a very low SSC if it is dominated by algae. It would be unusual to see significant SSCs resulting from algal blooms. The statement that, "algal-derived (organic) suspended material is the predominant form of suspended material affecting water quality" further implies an orientation to turbidity rather than SSC per se.

The basic situation on the Klamath with respect to sediment loads is not effectively communicated in this section. The basin above Cottonwood Creek (just upstream of highway I-5) is volcanic, with low sediment yields and relatively low gradients, and the river itself has a lower gradient because of geologic control. Precipitation and thus runoff is also relatively low. Passing downstream into the Klamath and then Coast Range geologic provinces, the mountains are rapidly uplifting, the river gradient increases, precipitation increases, and tributaries deliver vastly larger sediment loads to the mainstem. These downstream tributaries flow in response to winter rains, and thus SSCs are very high during winter storms. In the pre-disturbance Klamath River, SSCs would have dropped in summer months to clear water values. There may be land disturbances ongoing now that locally prevent this summer improvement in water quality, but in general the pattern of high suspended sediment (accompanying high flows) in winter, low, clear flows in summer, is determined by the seasonal hydrology.

Sediment trapping by Copco & Iron Gate
Together, Copco and Iron Gate Reservoirs impound about 10 percent of the total annual

average runoff in the Klamath River (an impounded runoff, IR, value of about 0.10). Based on the widely applied Brune (1953) relation (as adapted by Morris and Fan, 1997), the trap efficiencies of Copco and Iron Gate reservoirs would be predicted to be around 65 to 85 percent. That is, of the suspended sediment entering the upstream end of the reservoirs, only about 15 to 35 percent of it passes over/through the dams, on an annual average basis. This is a very rough method, which does not account for differences in reservoir geometry and operation.

The sentence, "Suspended sediment concentrations generally increase in a downstream direction from the contribution of tributaries, and since Iron Gate Dam currently effectively traps most suspended sediment", seems to be missing something. Presumably the argument is that the Klamath River is sediment starved because of the dam, and that the dam-produced deficit is compensated in a step-wise fashion with distance downstream of the dams. While a step-wise increase in suspended sediment loads is correct, the reason sediment loads start out so low is mostly due to the low sediment yields from the volcanic provinces, not the dam. Based on evidence such as measured volumes of sediment in the deltas of tributaries to Copco and Iron Gate reservoirs, CH2MHill (2004) estimated average sediment yield from the contributing basin between Keno and Iron Gate Dam to be a total of approximately 40,000 tons/year. By the confluence of the Scott River, the total load of the Klamath River exceeds 1,000,000 tons/year from sediment contributions downstream of Iron Gate. These differences are driven by geologic and climatic characteristics, and even if Copco and Iron Gate Dams trap 65-85% of the original 40,000 tons (i.e., 26-35,000 tons), this would make little difference in the face of a million tons from downstream tributaries and direct delivery from connected hillslopes.

While the Draft BO acknowledges that "major tributaries to the mainstem contribute large amounts of mineral suspended sediments to the river during winter and spring", the document does not convey the very different nature of the sediment regimes within the upstream volcanic province (where the four dams are located) and the downstream Klamath/Coast-Range provinces.

Mobilization and Transport of Sediment from Reservoir Deposits

The Draft BO relies on analysis of mobilization and transport of sediment from reservoir deposits developed by the US Bureau of Reclamation (USBR 2011, Greimann and Huang 2006). This work represents the state of the art and application of sound science. The Draft BO however, presents little information about the modeling. I am not sufficiently familiar with the requirements of this kind of document to know to what extent it needs to stand alone with adequate information within it, or to what extent it can rely by reference to other documents such as the USBR (2011) report.

The Draft BO cites USBR (2011) as the basis for its prediction that 1.2 – 2.9M tonnes of fine sediment will be released into the river through removal of Iron Gate Dam. The conclusion of this analysis is consistent with geomorphic principles and with observations on rivers experiencing pulses of sediment elsewhere. The expectation that if the year of dam removal proves to be a dry one, with relatively weak high flows, it can be

expected that some sediment mobilized from the reservoir deposits will be deposited in gravels downstream of the damsite. Silt and clay could be expected to remain within the mainstem gravels for a year, sand potentially longer if a series of dry years were to ensue. However, by the Shasta River confluence, the additional sediment from removal of the dam would be imperceptible. If removal was followed by a wet year, the additional sand would likely be reduced to less than 20% within a year. There are enough unknowns that any such prediction is inevitably approximate, but given the state of the science and the large number of variables involved, these predictions represent the best available science and constitute a sound basis for decision making.

The USBR (2011) analysis indicates that the mainstem reach immediately below the Iron Gate Dam site could be negatively affected for spawning, for up to several years in the worst-case scenario of a series of dry years. The Draft BO describes the gravels as being unsuitable for spawning, but salmon are capable of significantly cleaning fine sediment from spawning gravels (Kondolf et al. 1993), so that the process of spawning may be able to improve gravel quality sufficiently for successful spawning in many cases. (The cleansing by redd construction can be reversed by infiltration of fine sediment from the water column after spawning.) The preferred spawning habitats are likely to be tributaries, and with the passage barrier removed, potential spawners will have more sites to choose from, and would not be limited to spawning in the mainstem below the damsite, where sediment effects would be manifest.

The Draft BO also describes potential habitat impacts on rearing habitat from deposition of coarse sediment in the channel: predicted to be as much as 1.5 ft from Bogus to Willow Creek, less than 1 ft downstream (p.136). Given that the Klamath River above Cottonwood Creek is sediment-supply-limited, I frankly doubt the addition of sediment will have a net negative effect. It is possible that some pools will partially fill, but we could expect armored reaches to become more mobile and complex with the healthy addition of mobile sediments of gravel and sand-size.

Sediment Effects on Fish

In terms of direct effects of suspended sediment concentrations on fish, the approach of Newcombe and Jensen (1996) and Newcombe and MacDonald (1991) is widely used and is a reasonable approach to modeling acute effects of excessive suspended sediment on fish. (Note that the 1991 paper does not appear in the References Cited.) The Draft BO acknowledges weaknesses of the approach, including the assumption that effects of suspended sediment are necessarily bad, and that it does not account for the sequencing of days of exposure. It is useful to bear in mind that any analysis linking sediment transport models and exposure models cannot be precise given the multiple approximations and simulations involved, and the results of such models should not be confused with reality. However, given the limitations inherent in such an attempt, the modeling reported in the Draft BO appears to be suitable.

The analysis of potential exposure presented in Sec 6.3.1.1 appears to be reasonable, carefully thought out, and based on sound science. The results are a quantification of the likely impacts, number of fish affected, and mortality. One conclusion is that while the

effects are real and quantifiable, they are small relative to the potential benefits that the overall benefit of the project (dam removal) offers.

Likewise the analysis of potential exposure effects from the cofferdam and removal of the dam structure in Sec 6.3.2 appears to be reasonable, carefully thought out, and based on sound science.

Climate Change
In discussing likely effects of climate change, the statement that "the increase in winter temperatures will be especially dramatic" (p.64) is misleading. In fact, summer temperatures are predicted to increase more than winter temperatures, so it is not the winter temperature increase that is dramatic, but rather the hypothesized acceleration of juvenile growth and potential for early emergence, and the potential secondary geomorphic effects of warmer winter storms releasing rain-on-snow floods, triggering landslides, etc. These predictions certainly have merit and belong in this document, but the topic should be introduced by stating clearly it is the biological and secondary geomorphic effects of warmer temperatures that are expected to be of consequence. The temperature increases themselves may not merit the term "dramatic", at least in comparison to the higher summer temperatures. These native species have survived rainy winter storms in the Klamath basin and farther south for millennia, so the negative impacts of these storms being more frequent might better be posed as a hypothesis rather than a proven conclusion as the text could be interpreted now.

The Draft BO does not address the potential effects of the greater anticipated increase in summer temperatures. If this is considered not to be significant, the evidence and logic behind this need to be articulated.

Watershed Restoration
This section (p.68) refers only to projects outside the Klamath River basin, except for the formation of the "sub-working group" for the Scott/Shasta. While removing artificial barriers to allow access to historical spawning grounds is probably a clear ecological benefit, many other "restoration" projects are of questionable ecological benefit at best. The Draft BO would be strengthened if it referred to restoration projects within the Klamath River basin (especially in the reach directly affected by the four dams and immediately downstream) and cited evidence of effectiveness for these projects (such as post-project evaluation studies).

Conclusions/Recommendations
The Draft BO's conclusion that removal of the dams and release of stored sediment downstream will not jeopardize the SONCC coho salmon is scientifically justified. Overall, the document presents sound science in the appropriate context to support this conclusion.

2. Is the herbicide effects analysis in the draft biological opinion scientifically reasonable/supportable and logical?

I am not an expert on herbicide breakdown, transport, and toxicity. In carefully reading Sec 6.1.1.3, the approach appears to be reasonable and logical. However, my reaction should be taken with my lack of independent knowledge of the topic in mind.

Conclusions/Recommendations
The Draft BO's conclusion that herbicide application will not jeopardize the SONCC coho salmon appears reasonable based on available information.

3. Are the critical habitat and coho salmon effects analysis comprehensive?

As a geomorphologist, I am perhaps not the most qualified person to address this question. With that caveat, the analysis seems to be comprehensive, but I found it much of the text was not clearly written and largely beside the point, and questionable or incorrect in some particulars.

The analysis seems to cover SONCC coho generally rather than specifically Klamath River coho. Much of the document seems to be taken from the draft SONCC recovery plan (NMFS 2012). Because of this, the Draft BO was sometimes short on information specific to coho in the Klamath River. Other sources such as NRC (2004) and NMFS (2011) seem to cover the Klamath run better.

I was glad to see the acknowledgement that hatchery operations can conflict with coho recovery, and that agency policies with respect to hatcheries are not always consistent. Hatchery fish issues are germane to assessing the effects of removing the dams on coho on several counts: funding for the Iron Gate Hatchery will not be guaranteed after the dam is gone, the coho redds in the mainstem that will be destroyed are probably those of hatchery fish, and interactions with hatchery fish probably affects the survival and fitness of naturally spawned coho. The Draft BO discusses potential problems from hatchery fish and states the overall effect of the closure of the hatchery as positive for coho (pp166-167), consistent with current scientific understanding. If anything, the discussion about the negative effects of hatchery fish on wild coho could be strengthened. My impression is that domestication selection can occur even when there is an "infusion of wild genes," contrary to the suggestion on p. 62. Araki et al. (2007), which is cited by the Draft BO, provides strong evidence for domestication selection. This article is well cited in the literature, and using Google Scholar one can locate other relevant papers dealing with the effects of hatchery coho on wild coho that are not cited by the Draft BO, such as Araki et al. (2008; 2009), Buhle et al. (2010) and Chilcote (2011).

Regarding some particulars, the Draft BO states on p. 95 that "Temperatures greater than 26°C are invariably lethal (Moyle 2002)." I did not check Moyle (2002), which is a general reference covering all California freshwater fish, but the chapter on coho in NRC (2004), of which Moyle is an author, points out that juvenile coho survived temperatures

that reached 29°C in the unusual conditions following the eruption of Mt. Saint Helen. The Draft BO (p. 94) also cites NRC (2004) incorrectly regarding the size of coho fry at emergence; it should be 30-35 mm, not 30-50.

I did not find a discussion of the diet of migrating juvenile salmonids or of the effects of increased fine sediment during the initial years after dam removal on the organisms making up the diet. This seems important, as the migration period seems to be long enough that reduced growth would matter for juveniles migrating down out of the tributaries.

Conclusions/Recommendations
The Draft BO's analysis of critical habitat and coho salmon effects appears to be scientifically sound and comprehensive. As discussed above, I question some of the details, but overall the document presents sound science in an appropriate context.

4. Are there any missing critical assumptions and effects to fish and habitat (coho, eulachon, green sturgeon) that should be in the draft biological opinion?

I did not notice any such missing critical assumptions.

Conclusions/Recommendations
I did not notice any missing critical assumptions regarding effects to fish and their habitat. The Draft BO's analysis appeared to be comprehensive.

5. What sections of the draft biological opinion need to be improved, and any recommendations on how?

I found much of the Draft BO, especially Section 4, to be very hard to read and less informative than I would have hoped it to be. Other materials such as NRC (2004) and the brief discussion in NMFS (2011) were clearer and more informative than the Draft BO. I have the impression that the authors of the Draft BO were laboring to make the language seem academic. The result is an abundance of jargon, which could make the Draft BO inaccessible to members of the public (the educated layman) and the decision makers, for whom phrases like 'multiple forms of stochasticity' (p.66) may not roll off the tongue. For journal articles, the often severe space limitations and specialist readership justifies some of the academic jargon (some is just bad writing), but the BO should be clear to a larger audience. The BO will be more effective if the language is clear and direct. NRC (2004) provides a good model to follow.

Part of the trouble is organizational. For example, 4.1.3, on the status and trend for SONCC coho, describes the VSP concepts used to assess the status and trend, but not the actual status and trend. Some of the material seems to be boilerplate. For example, at the bottom of p. 45, the Draft BO notes that the resilience of a population to environmental variance is reduced when "entire life history strategies are lost," which is true enough but

of doubtful applicability to coho, which have a rather simple and rigid life history, as noted at p. 42. Generally, I found much of the material extraneous to the matter of removing the Klamath River dams, but I infer from the questions posed that NMFS thinks there is a legal reason that it should be there.

Part of the problem is also just language. For example, I think that Section 4.1.9.8 could be rewritten to be easier to understand the term "stochastic pressure", which strikes me as academic jargon that unnecessarily clouds the discussion. A clear explanation of how chance events or combinations of them are more likely to wipe out small populations seems more appropriate. Some of the sentences in the Draft BO do not mean what they say, such as the sentence at p. 69: "Within the range of the SONCC coho salmon ESU, the life cycle of the species can be separated into five essential habitat types: (1) juvenile summer and winter rearing areas; (2) juvenile migration corridors; (3) areas for growth and development to adulthood; (4) adult migration corridors; and (5) spawning areas."

The list of references should be complete; some of the papers cited are not in the reference list, such as Williams et al. 2011 (p. 48) or Sharr et al. 2000 (p. 51).

Section 5.1.1 needs to be written.

Conclusions/Recommendations
I found parts of the text difficult to follow because of writing style and excessive jargon, some of the text was repetitive, and I don't know that a reader not previously familiar with the region would gain a clear picture of how the Klamath River system works as a framework for understanding potential dam removal impacts. With the exception of points noted above, however, the problems lie with presentation/writing, and overall the problems do not undermine the conclusions presented.

6. Does the biological opinion represent the best scientific information available?

Generally it does, on the most relevant issues. The sediment modeling presented in USBR (2011) is state of the art, and the document generally applies the results of this analysis appropriately.

A possible exception to 'best scientific information' concerns the KRWQM. According to Appendix D,

> While the KRWQM possesses many beneficial attributes, the computationally intensive nature of the model components and the fine temporal scale of the output means that application of this model to Project alternatives analyzed for the Klamath Facilities Removal Environmental Impact Statement/Environmental Impact Report (EIS/EIR) over the period of analysis (i.e., 50 years) is not practical. Numeric models used to develop water quality effects determinations for the Proposed Action and Alternatives are presented in Table D-1.

This is not persuasive, because the main impact of concern (mobilization of sediment stored behind the dams) will occur in just a few years.

Conclusions/Recommendations
The Draft BO's conclusion that removal of the dams will not jeopardize the SONCC coho salmon is scientifically justified. Overall, the document presents sound science in the appropriate context to support this conclusion.

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USFWS and NMFS (United States Fish and Wildlife Service and National Marine Fisheries Service). 2011. *Joint Biological and Conference Opinion on the Proposed Removal of Four Dams on the Klamath River*. National Marine Fisheries Service Southwest Region and Fish and Wildlife Service Region 8. CIE Review Draft dated December 16, 2011.

APPENDIX 1. BIBLIOGRAPHY OF MATERIALS PROVIDED FOR REVIEW

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ADDITIONAL DOCUMENTS PROVIDED

URLs were provide for the following documents:

Klamath Dam Removal Draft BO and EFH Assessment
Documents helpful for CIE reviewers:

Bartholomew JL and J.S. Foott. 2010. Compilation of Information Relating to Myxozoan Disease Effects to Inform the Klamath Basin Restoration Agreement. http://klamathrestoration.gov/sites/klamathrestoration.gov/files/Disease%20synthesis_11-1_final.bartholomew.foott.pdf

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APPENDIX 2. CIE STATEMENT OF WORK

Statement of Work for Dr. Mathias Kondolf

External Independent Peer Review by the Center for Independent Experts

Biological Opinion on the Klamath Hydroelectric Settlement Agreement and accompanying EIS

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Technical Representative (COTR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from www.ciereviews.org.

Project Description: Pursuant to the National Environmental Policy Act (NEPA), the Department of the Interior (Department), through the Bureau of Reclamation (Reclamation), intend to prepare an EIS/EIR. The EIS consider whether to remove four dams on the mainstem Klamath River pursuant to the terms of the Klamath Hydroelectric Settlement Agreement (KHSA), thereby proposing the largest dam removal restoration action in US history. Conflicts over water and other natural resources in the Klamath Basin between conservationists, tribes, farmers, fishermen, and State and Federal agencies have existed for decades. Since 2003, the United States has spent over $500 million in the Klamath Basin for irrigation, fisheries, National Wildlife Refuges, and other resource enhancements and management actions. Consequently, the United States, the States of California and Oregon, the Klamath, Karuk, and Yurok Tribes, Klamath Project Water Users, and other Klamath River Basin stakeholders negotiated the Klamath Basin Restoration Agreement (KBRA) and the KHSA (including the Secretarial Determination) to resolve long-standing disputes between them regarding a broad range of natural resource issues. This is a landmark federal action with a recent litigious history. The project has large potential implications on the economy of California and Oregon, commercial, tribal and recreational fisheries in California and Oregon, and tribal and public trust resources.
The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. CIE reviewers shall have working knowledge and recent experience in the application of hydrology, river restoration, and pacific salmon life history needs. Each CIE reviewer's duties shall not exceed a maximum of 10 days to complete all work tasks of the peer review described herein.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review as a desk review, therefore no travel is required.

Statement of Tasks: Each CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, the CIE shall provide the CIE reviewer information (full name, title, affiliation, country, address, email) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, and other pertinent information. Any changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

Desk Review: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
3) No later than 16 January 2011, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and CIE Regional Coordinator, David Die, via email to ddie@rsmas.miami.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

2 December 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
16 December 2011	The report availability date in which the NMFS Project Contact sends the CIE Reviewers the report and background documents
16 December 2011–16 January 2012	Each reviewer conducts an independent peer review as a desk review
16 January 2012	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
30 January 2012	CIE submits the CIE independent peer review reports to the COTR
6 February 2012	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the COTR within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering

Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) each CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) each CIE report shall address each ToR as specified in **Annex 2**,
(3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

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Key Personnel:

NMFS Project Contact:

Jim Simondet
National Marine Fisheries Service, 1655 Heindon Rd., Arcata, CA 95521
Jim.simondet@noaa.gov Phone: 707-825-5171

Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work

Annex 2: Terms of Reference for the Peer Review

Biological Opinion on the Klamath Hydroelectric Settlement Agreement and accompanying EIS

1. Are the assumptions and the effects conclusions in the biological opinion scientifically reasonable/supportable and logical, especially pertaining to the suspended sediment analysis?
2. Is the herbicide effects analysis in the draft biological opinion scientifically reasonable/supportable and logical?
3. Are the critical habitat and coho salmon effects analysis comprehensive?
4. Are there any missing critical assumptions and effects to fish and habitat (coho, eulachon, green sturgeon) that should be in the draft biological opinion?
5. What sections of the draft biological opinion need to be improved, and any recommendations on how?
6. Does the biological opinion represent the best scientific information available?